

PHYS 821: Advanced Dynamics

Lecture: MW 11:30, CW 145

Spring 2012

Instructor:

Brett Esry

CW 325

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Textbook:

Classical Mechanics, Third Edition, Goldstein, Poole, and Saffko

NOTE: For errata and corrections for the textbook, including end-of-chapter problems, see

<http://astro.physics.sc.edu/goldstein/>.

Supplements:

In order of increasing difficulty level:

- *Analytical Mechanics*, Fowles and Cassiday
- *Mechanics*, Symon
- *Classical Dynamics of Particles and Systems, Fifth Edition*, Thornton and Marion
- *Theoretical Mechanics for Particles and Continua*, Fetter and Walecka

Grading:

Exam 1 15%

Exam 2 15%

Final 20%

Homework 50%

Course philosophy:

This course will challenge you. I expect that you will learn the most from the homework, so there will be quite a bit of it: assignments will be given roughly once per week and will take an average of about 10 hours each. I encourage you to discuss the problems with your classmates, but you should write up the assignment *on your own*. Some assignments will require numerical solutions using your own codes, Mathematica, or your favorite numerical package.

Guidelines for homework:

- Discuss your homework with classmates as much as you like, but *write your homework solutions on your own!* There will be a severe grade penalty for copying.
- As a scientist in training, you need to learn to communicate scientific information in an effective, efficient manner. You should consider homework assignments as practice in this art. It is your responsibility to present your homework solutions in a readable, logical manner — not mine to decipher and interpret them. There will be a grade penalty.
- In an incorrect solution, I will reward statements on homework and on exams that show you know it is incorrect and why. I will also reward any (correct!) effort above and beyond what is explicitly asked for in a problem. Conversely, if you give a grossly incorrect solution, but make no indication that you know it is grossly incorrect, there will be a grade penalty beyond just getting the problem wrong.

Tentative Course Outline:

The following is a tentative list of topics that will be covered in lecture (in no particular order):

- Lagrangian and Hamiltonian mechanics
- Small oscillations and normal modes
- Principle of least action and the calculus of variations
- Motion under a central force and scattering theory
- Canonical transformations, Hamilton-Jacobi theory
- Special relativity
- Continuous systems
- Perturbation theory

Required statements:

Statement Regarding Academic Honesty:

Kansas State University has an Honor System based on personal integrity, which is presumed to be sufficient assurance that, in academic matters, one's work is performed honestly and without unauthorized assistance. Undergraduate and graduate students, by registration, acknowledge the jurisdiction of the Honor System. The policies and procedures of the Honor System apply to all full and part-time students enrolled in undergraduate and graduate courses on-campus, off-campus, and via distance learning. The honor system website can be reached via the following URL: <http://www.ksu.edu/honor>. A component vital to the Honor System is the inclusion of the Honor Pledge which applies to all assignments, examinations, or other course work undertaken by students. The Honor Pledge is implied, whether or not it is stated: "On my honor, as a student, I have neither given nor received unauthorized aid on this academic work." A grade of XF can result from a breach of academic honesty. The F indicates failure in the course; the X indicates the reason is an Honor Pledge violation.

Statement for Academic Accommodations for Students with Disabilities:

Any student with a disability who needs a classroom accommodation, access to technology or other academic assistance in this course should contact Disability Support Services (dss@k-state.edu) and/or the instructor. DSS serves students with a wide range of disabilities including, but not limited to, physical disabilities, sensory impairments, learning disabilities, attention deficit disorder, depression, and anxiety.

Statement Defining Expectations for Classroom Conduct:

All student activities in the University, including this course, are governed by the Student Judicial Conduct Code as outlined in the Student Governing Association By Laws, Article VI, Section 3, number 2. Students who engage in behavior that disrupts the learning environment may be asked to leave the class.